

MULTIMEDIA



UNIVERSITY

STUDENT IDENTIFICATION NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

BEM 1034 – MATHEMATICS FOR ECONOMICS
(All Sections / Groups)

04 MARCH 2020
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages, including a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1[Total =25 marks]

a) Solve for $\log_4(2x+1) - \log_4(x-3) = 1$ [5 marks]

b) A market share S (in percentage) of a company expects t month after a new product is introduced is given by $S = 40 - 40e^{-0.05t}$. How many months will it take for the market share to reach 25%? [5 marks]

c) For the following system of equations:

$$3x_1 + 8x_2 - x_3 = -18$$

$$2x_1 + x_2 + 5x_3 = 8$$

$$2x_1 + 4x_2 + 2x_3 = -4$$

- (i) Write the system into matrix form $AX = B$ [1 mark]
(ii) Find the determinant of matrix A . [2 marks]
(iii) Find the cofactor, adjoint and inverse of matrix A . [9 marks]
(iv) Using inverse method, solve the system of equations above. [3 marks]

Continued.....

Question 2[Total =25 marks]

- a) For the following matrices,

$$A = \begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 0 & 0 \\ 1 & 6 & 1 \\ 5 & 2 & 4 \end{bmatrix}, \quad C = \begin{bmatrix} -2 & 3 & 0 \\ 1 & -4 & 1 \end{bmatrix}$$

Perform the indicated operation:

(i) $C(A + B)$ [5 marks]

(ii) AB^T [4 marks]

- b) The economy of a country has a rubber industry, palm oil industry and coconut industry, with the following technology matrix.

$$A = \begin{array}{ccc|l} & R & P & C \\ \hline 0.6 & 0.2 & 0.2 & Rubber \\ 0.1 & 0.4 & 0.5 & PalmOil \\ 0.1 & 0.2 & 0.2 & Coconut \end{array}$$

If the country wishes to have surpluses of 100 units of rubber production, 272 units of palm oil production and 200 coconut production, find the gross production of each industry.

[16 marks]

Continued.....

Question 3 [Total =25 marks]

a) Determine if the function $f(x) = \frac{x+3}{x^2-4}$ is continuous at $x = 3$. [6 marks]

b) Find the values where the function $g(x) = \frac{x-6}{x^2+4x}$ is discontinuous. [3 marks]

c) Find the derivatives of the following function:

(i) $y = 2x^7 - \frac{5}{\sqrt{x}}$ [3 marks]

(ii) $y = \frac{e^{-4x}}{1+3x}$ [4 marks]

(iii) $y = x^3(1-3x)^2$ [4 marks]

d) If the utility function of an individual takes the form

$$U = \frac{x^2 + 1}{y}$$

where U is total utility and x and y are the quantities of two commodities consumed. Find the marginal-utility function of each of the two commodities. [5 marks]

Continued.....

Question 4[Total = 25 marks]

a) Solve the following integral:

(i) $\int \frac{5x^3 - 7x^2 - 2x + 4}{x^2} dx$ [4 marks]

(ii) $\int (4t^2 - 3t)^4 (8t - 3) dt$ [5 marks]

b) The number of units, x , demanded for a product depends on the unit price, p (in RM), and is given by

$$p = 16 - 0.005x^2$$

(i) Given that the equilibrium price is RM8, find the equilibrium quantity. [4 marks]

(ii) Calculate the consumer's surplus. [5 marks]

c) Solve the following implicit differential equation by separation of variables:

$$\frac{dy}{dx} = 4x^3 y - y$$
 [7 marks]

End of page

Formulae:**1. Input-Output Model**

$$(I - A)X = D$$

where A is the input-output matrix, D is the external or final demand and X is the production level.

2. Consumers' Surplus (CS) and Producers' Surplus (PS)

$$CS = \int_0^{\bar{x}} D(x)dx - \bar{p}\bar{x}$$

$$PS = \bar{p}\bar{x} - \int_0^{\bar{x}} S(x)dx$$

where \bar{p} is the unit market price, \bar{x} is the quantity sold, D is the demand function and S is the supply function.